

b-jet and non-prompt D-meson correlation in hard QCD events

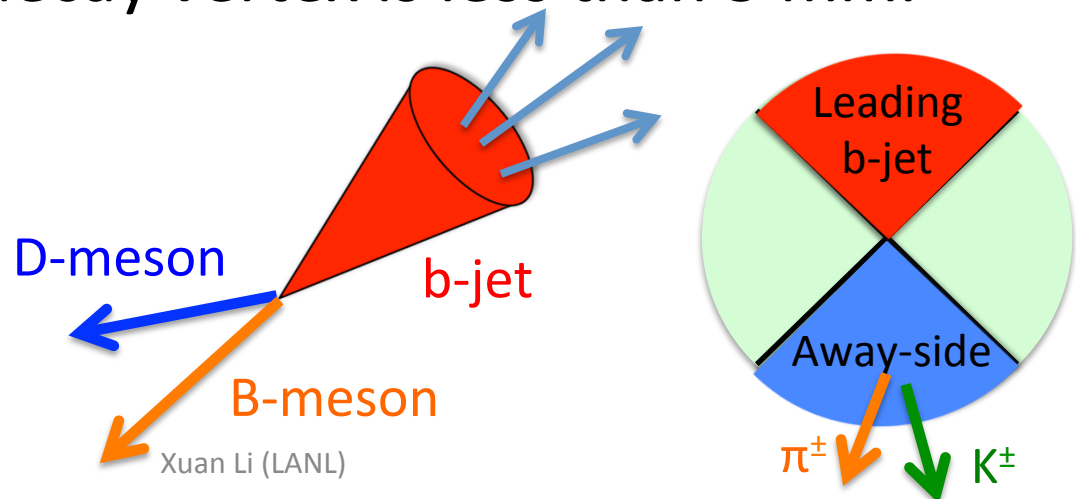
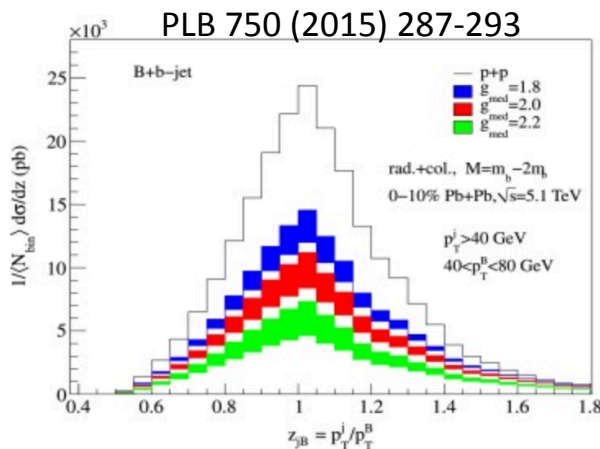
Xuan Li (LANL)

Motivation

- Through the b-jet and B hadron correlations with B hadron within the leading b-jet jet cone and B hadron within the away-side b-jet jet cone,
 - understand the $b \rightarrow B$ hadron fragmentation process when comparing to di b-jet correlations (<https://indico.bnl.gov/conferenceDisplay.py?confId=2678>).
 - Extend the z_j scale to lower p_T region but the cost is the branching ratio and decay smearing of $b \rightarrow B \rightarrow D$.
 - help understand the b quark energy loss in Au+Au collisions.
- Use non-prompt D meson to tag B hadron, and study b-jet and non-prompt D meson correlations to
 - understand the origin of inclusive non-prompt-D meson.
- The D meson reconstruction studies allows the search of prompt D meson tagging jets, which will provide the information about c-jets and help understand the mass/ flavor dependent parton energy loss.

PYTHIA8 simulation

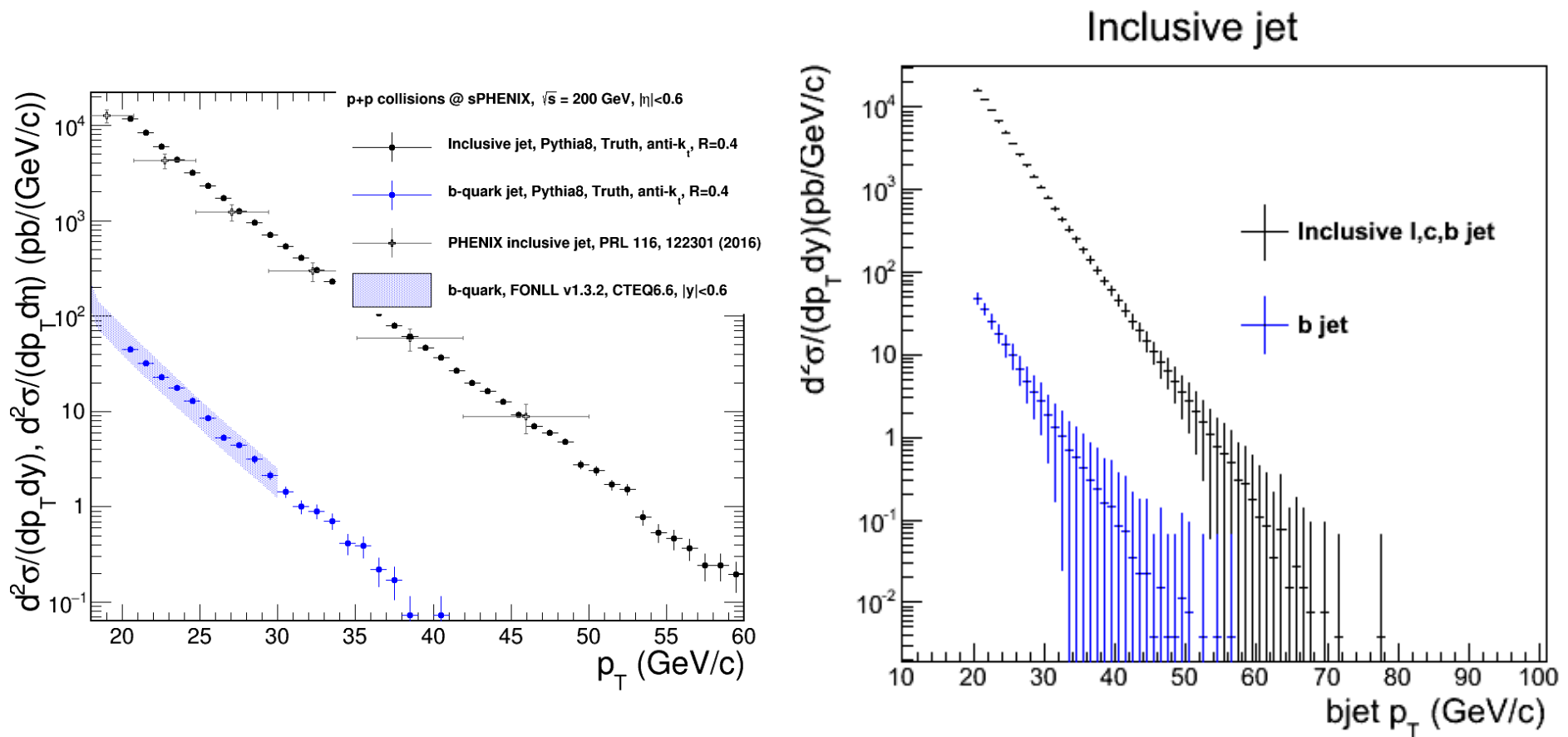
- Run 18M PYTHIA8 Hard QCD simulation events.
- Only look at events contain leading jets with $p_T > 20 \text{ GeV}/c$ and within $|\eta| < 1.0$.
- Check the away-side B-meson and D-meson z_j .
- Look at all away-side kaons and pions with $p_T > 0.3 \text{ GeV}/c$ and displaced vertex.
- For kaons and pions, form pairs between them with opposite charge sign and only when the differences between their z decay vertex is less than 5 mm.



Xuan Li (LANL)

Cross-check with the b-jet cross section in MVTX pre-proposal

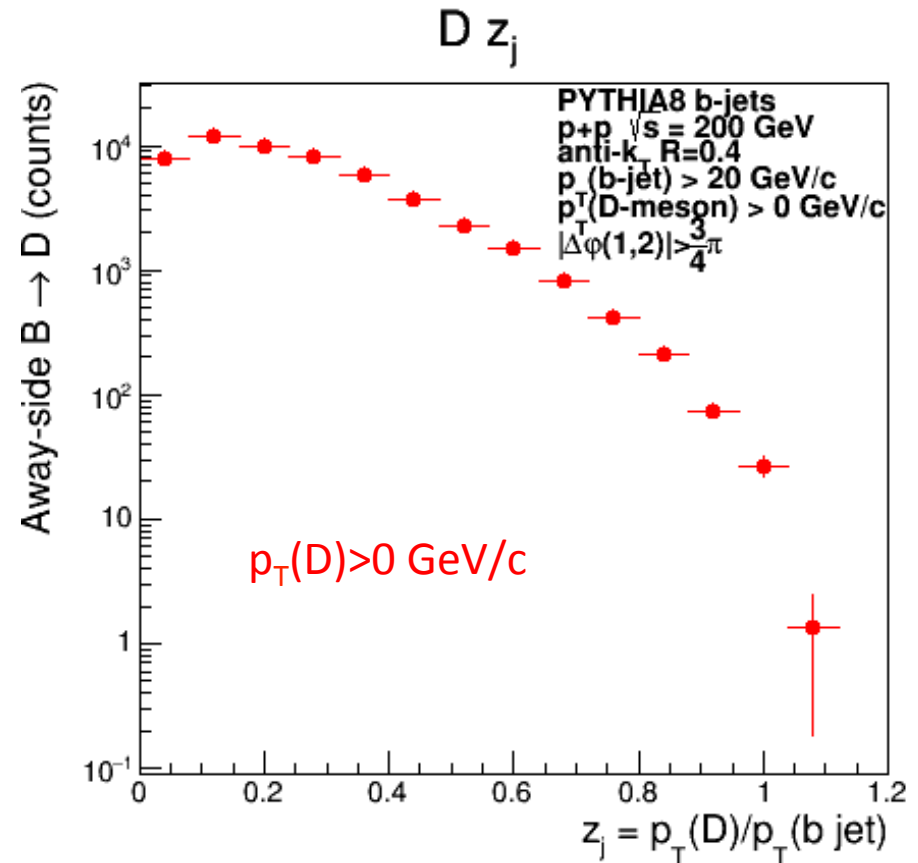
- My PYTHIA MB inclusive jet cross section (right) is comparable with the MVTX pre-proposal figure 5 (left).



p+p b-jet and non-prompt D projection

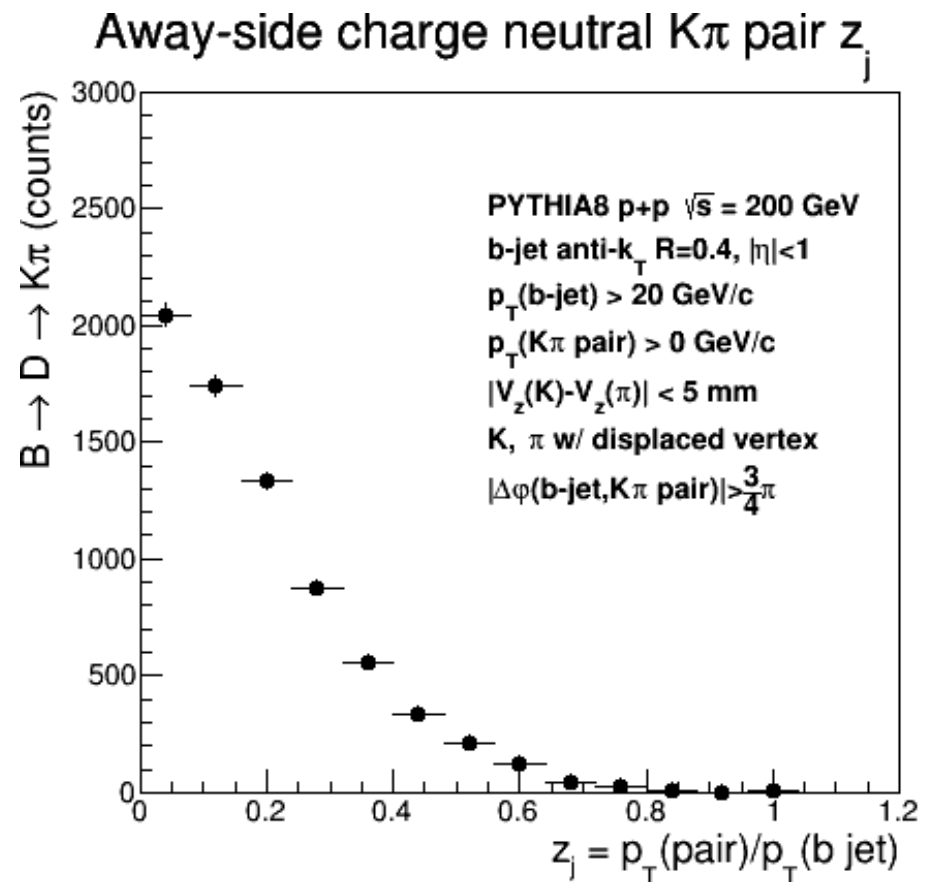
- Assume b-jet tagging efficiency is 0.5 and its purity is 1. The purity needs further studies.
- Assume non-prompt D efficiency is 0.6.

- Cross check with b-jet and D meson decay from B meson.
- The steeply following is due to the kinematics of D from B meson decay.



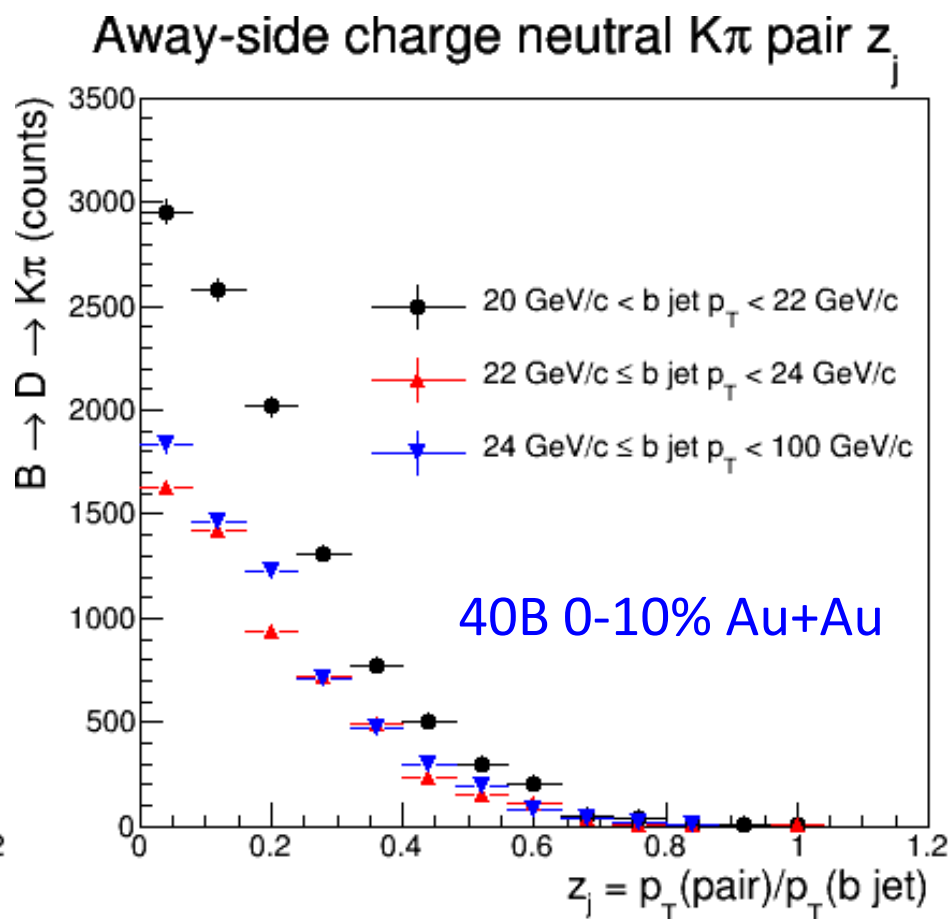
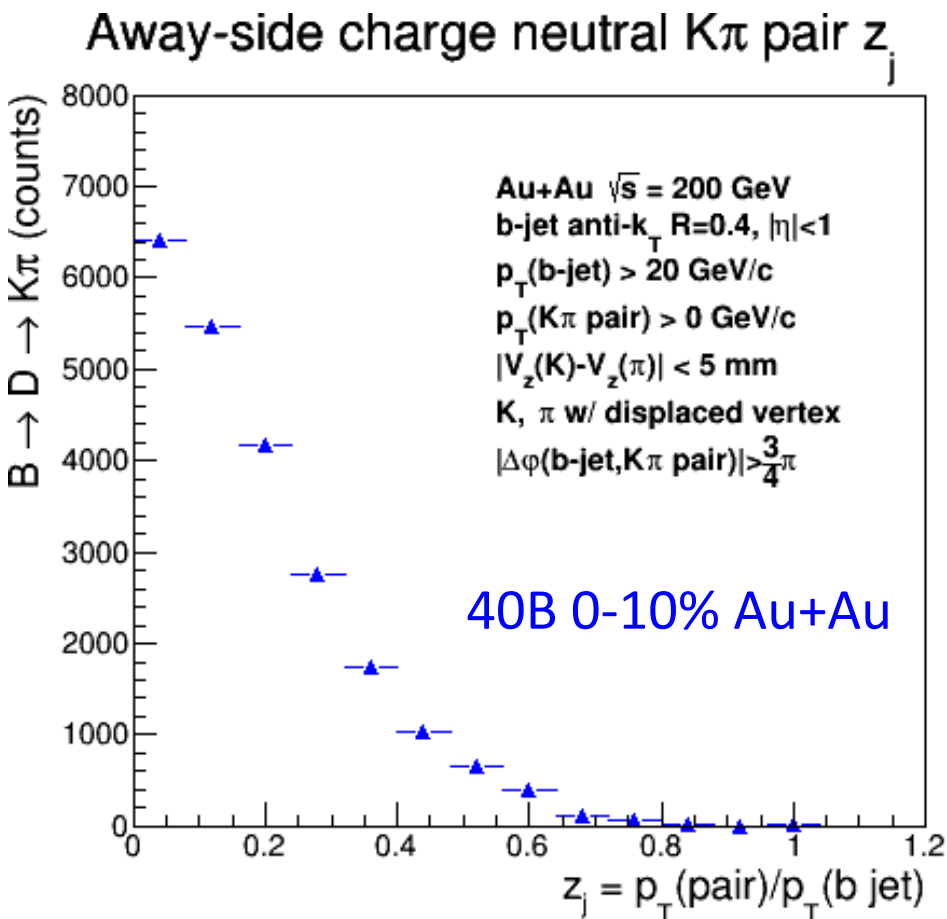
p+p b-jet and non-prompt D projection

- Assume b-jet tagging efficiency is 0.5 and its purity is 1. The purity needs further studies.
- Assume non-prompt D efficiency is 0.6.
- For p+p, assume the integrated luminosity is 175 pb^{-1} , and this number could be doubled for more than 4 year data taking periods.
- Background is not evaluated and needs further studies.



Au+Au b-jet and non-prompt D Projections

- Projection in 40B 0-10% Au+Au events.
- Integrated p_T and divided into three different p_T bins.



Non-prompt D meson purity determination

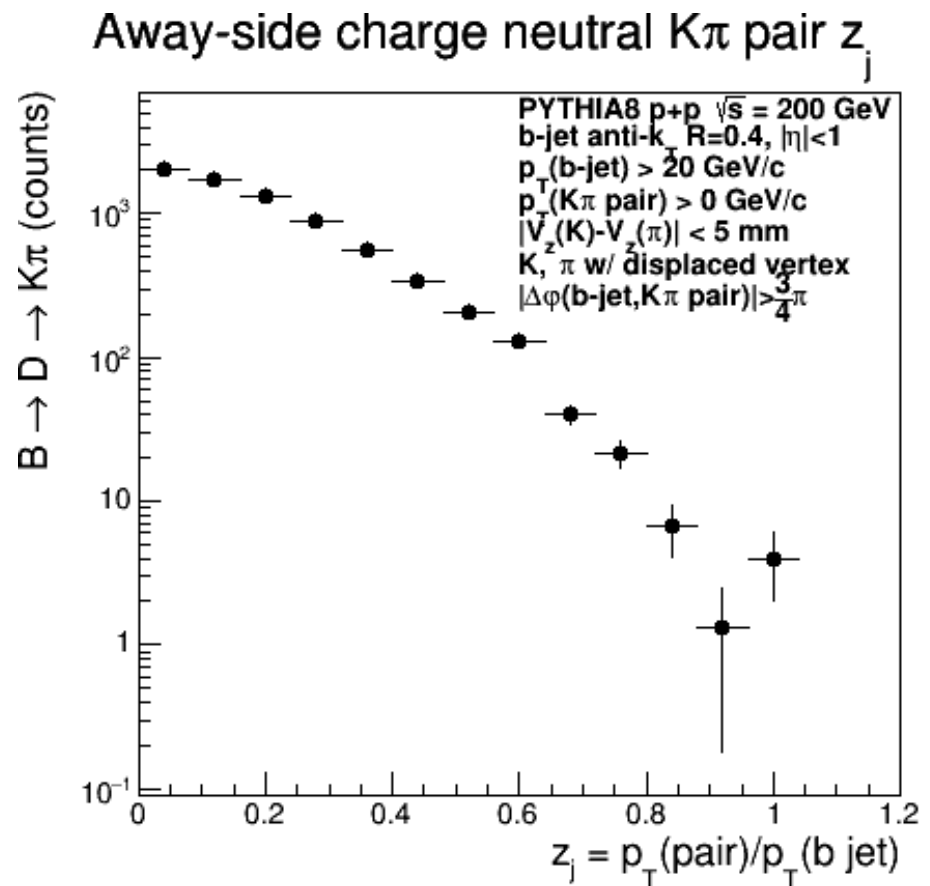
- Evaluate realistic D meson purities in p+p and Au+Au collisions with detector response.

Suggestions?

Backup

p+p b-jet and non-prompt D projection

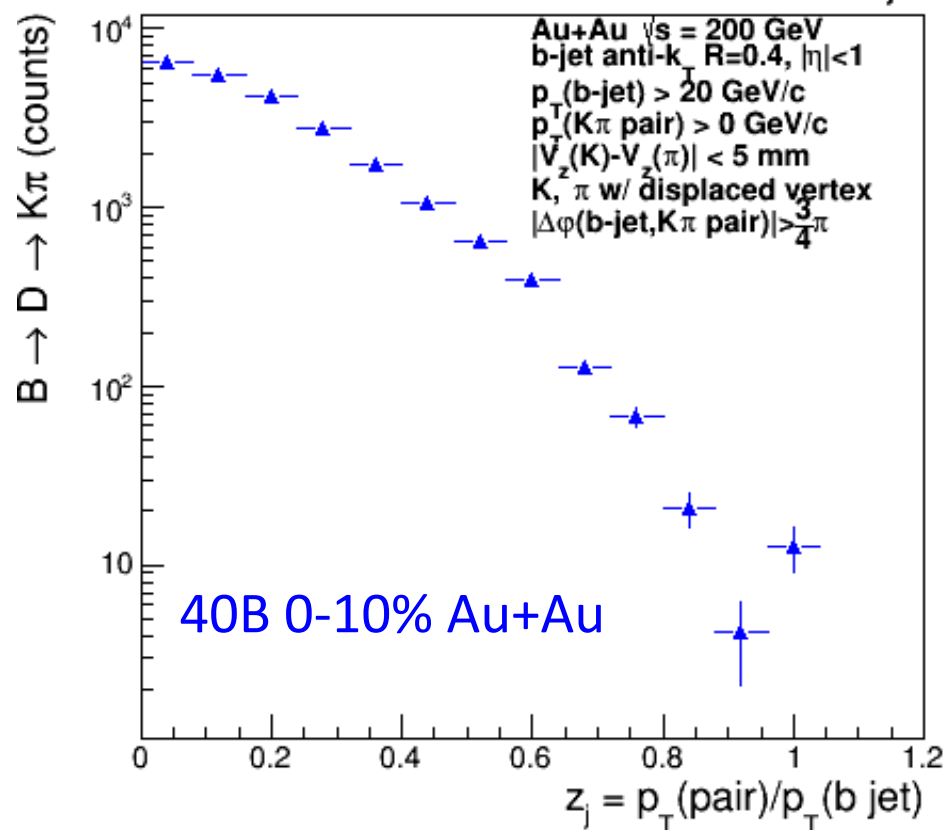
- Assume b-jet tagging efficiency is 0.5 and its purity is 1. The purity needs further studies.
- Assume non-prompt D efficiency is 0.6.
- For p+p, assume the integrated luminosity is 175 pb^{-1} , and this number could be doubled for more than 4 year data taking periods.
- Background is not evaluated and needs further studies.



Au+Au b-jet and non-prompt D Projections

- Projection in 40B 0-10% Au+Au events.
- Integrated p_T and divided into three different p_T bins.

Away-side charge neutral $K\pi$ pair z_j



Away-side charge neutral $K\pi$ pair z_j

